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Agricultural Education:

HISTORICALLY CONSIDERED.

By Prof. C. W. Scott

OF THE N. H. COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

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AGRICULTURAL EDUCATION.

It is a long step from the scholastic education of the Middle Ages to the practical education attempted in the scientific and technical schools of to-day; but it is natural that the rebellion against the former should end in the establishment of the latter. Bacon himself probably never had a conception of such a result, yet it has been the logical outcome of his philosophy. Since that philosophy produced an entire series of new sciences, his disciples could not consistently do otherwise than introduce these sciences in their plan of education, even at the expense of the studies most honored by Bacon himself. To the oft-repeated assertion, that he tried to make thought practical, may be added the other assertion, that this century threatens to exclude from education everything but the practical.

In carrying out the plans for practical education, scientific and technical schools have been founded, apparently with very modest intentions, and have then been pushed into positions which sometimes must seem as surprising to their founders as to their competitors.

At first thought, it would seem that a training for a special occupation would never enter the plane of a liberal education in a college with a long-established course. Perhaps that would be true in a society with fixed social layers: it is not true in America. The two classes of graduates have been brought into constant competition. The technical student is thus influenced in a twofold way: First, he demands a wider scope in his studies; and next, he demands equality between his school, which counts its age in months, and the old colleges which are the growth of years. His own success in life is perhaps his most convincing argument. As a result, all schools of this class have rapidly advanced in position and influence, forming a series in which the agricultural college comes last in time and development.

The first of the polytechnic schools appeared in France, during the years which followed the great revolution. After France followed Austria, Switzerland, and Germany, and by the middle of the present century there was through Europe a chain of strong scientific schools, provided generally with costly appliances, and always supported by government patronage.

The first scientific school in America was probably the military academy established at West Point in 1802. Though a military school, its graduates, as explorers, engineers, and scientific men, have gained reputation in the peaceful walks of life, quite as much as on the battle-field. Among the graduates of the class of 1806 was Capt. Alden Partridge, a man who was remarkable for his ability and energy, and exerted a marked influence in shaping the scientific education of New England. He became an instructor at West Point, and was for a short time commander. In 1820 he established a military academy at Norwich, Vt., and afterwards similar schools in several other states. The Norwich academy, after some changes, developed into Norwich University, which seems entitled to claim the honor of being, next to West Point, the oldest of all the scientific schools of the country.

In Europe, the year 1799 saw the founding of three agricultural schools,—one in Austria, one in Prussia, and a third in Switzerland; and several years after, others were established in Austria. But in America there had been no recognition of the claims of agriculture upon the schools, when, in 1826, at Troy, N. Y., the Rensselaer Polytechnic Institute was established. The school was named from the patron who furnished the means for starting it; but the real founder was Amos Eaton, who was first at the head of the institution. This was the first school of science not on a military basis, and its object was stated to be "The application of science to the common purposes of life, and especially to the qualification of teachers to instruct in the application of chemistry and natural history to agriculture, domestic economy, and the arts and manufactures." During the next quarter of a century the scientific influence took hold of the leading colleges of New England. In 1847 there was an endowment for the Lawrence Scientific School at Harvard ; and at Yale, in the same year, an agricultural chemist (John P. Norton) made a beginning for a school which, when endowed, several years later, became the Sheffield Scientific School. During this time a similar endowment for a scientific school had been received at Dartmouth college.

The half century from 1825 to 1875 was a period of growth such as would naturally give prominence to scientific or technical schools. The development of new territories gave opportunities for graduates to coin practical information into dollars. Public works and great systems of railroads were constantly turning young graduates into civil engineers. While professional students left the college to begin a long and expensive course of study, many graduates of scientific schools, which gave less mental discipline, were stepping directly into positions which offered fair pay and flattering prospects. This condition of things gave the scientific schools a strong leaning towards engineering. The tendency is well illustrated by the institution at Troy, N. Y., which dropped all thought of agriculture, or its applications, and became one of the most technical and most successful of engineering schools.

These years also saw a rapid development of agricultural interests, and a corresponding increase of agricultural wealth. Cheaper transportation increased the value of the product of the farm ; new mechanical appliances decreased the drudgery of farming. From 1850 to 1870 the value of farming implements in the country more than doubled ; agricultural chemistry was being developed ; other sciences, themselves new, were being pressed into the service ; and agriculture was being slowly pushed towards the position of a science. There were new questions to be considered about commercial fertilizers and animal nutrition, while irrigation and drainage, stock-breeding and dairying, were coming to be considered in a new light.

In every new demand for educational facilities, there were to be considered the agricultural societies reckoned by hundreds, the agricultural papers which numbered nearly a hundred, and their readers who had to be reckoned by the hundred thousand. Hence, with the general demand for practical education was joined a special demand for an education adapted to the needs of farming communities, and directly or indirectly putting dollars into the pocket of the farmer. To establish a system of schools for these purposes, in the manner in which other colleges had been established, by the munificence of individuals, would be the work of centuries. The advocates of these institutions would see them spring forth and bear fruit in a decade or two; so they turned to the national government for help to establish them. For this there was sufficient precedent: the principle of granting lands of the public for educational purposes is older than the constitution itself, and dates back as far as 1787, when a sale of land in south-eastern Ohio was made to the New England Ohio Company. At that time two entire townships were set apart for the purposes of a university.* In 1794 there was another grant to Ohio for educational purposes, and by 1821 nine other states had received aid of this kind. Before the latter date, and for years after, there were discussions over the claims of the older states, and repeated attempts to induce congress to recognize these claims, and put all the states upon the same basis. As agricultural education came to be discussed, its claims were united with those of practical education, the former being considered one of the important branches included in the scheme of the latter. The movement gathered force in the West, and Illinois seemed to be the leader. At a meeting called in that state, in 1851, to discuss the question of a different kind of education, two resolutions fairly expressed the demand. One resolution expressed the following: "That as the representatives of the industrial classes, including the cultivators of the soil, artisans, mechanics, and merchants, we desire the same privileges and advantages for ourselves, our fellows, and our posterity, in each of our several pursuits and callings, as our professional brethren enjoy in theirs." *

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* *Ten Brook's State Universities*, p. 66 and following.

In a second resolution it was asserted that the wants of these classes could not be met by the institutions designed to meet the wants of the professional classes. In 1852 there was a second convention at Springfield, and a third at Chicago, and a league was formed and a resolution adopted to memorialize congress to make a grant of lands to establish and endow industrial colleges in every state in the Union. In a fourth convention, in 1853, a memorial to the legislature was prepared. In it the petitioners assert that they need the same application of knowledge to their pursuits which the learned professions enjoy. They inquire what kind of military commanders the classical colleges can make, and then assert that these colleges are as well fitted to supply the place of West Point as to meet the demands of farmers and mechanics. They show, taking the country together, that only one two-hundredth of the population are in professional occupations; they assert that more than two hundred colleges and schools of high standing are devoted wholly to the interests of the professional classes, while there is not one "with a liberal endowment designed for the liberal and practical education of the industrial classes."

In the same spirit the legislature passed a series of resolutions, and gave instructions to the representatives in congress, directing them to use their influence to secure an appropriation of land to be used in founding industrial universities, as the resolution says, "for the more liberal and practical education of the industrial classes and their teachers."

Illinois invited the other states to unite in the work, and almost at the same time with this movement was one in the same direction in the Eastern states. The *New York Tribune* had many kind words to say in favor of the plan. The governor of New York endorsed it in an annual message, and recommended a state college planned to unite instruction in agriculture and in the mechanical sciences. In Massachusetts, Hon. Marshall P. Wilder recommended the movement; and President Hitchcock, of Amherst college, had advocated the principle as early

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*See article on agricultural education in *American Encyclopœdia of Agriculture*, which has been freely used in writing the early history of the movement.

as 1851, before the Massachusetts Board of Agriculture. In 1853 there was a convention at Albany, N. Y., to discuss the subject and settle on some plan of action ; and for several years it was kept before the public, being advocated by influential papers, and endorsed by leading men. In a few states agricultural schools or colleges were organized. The first of these schools is said to have been at Cleveland, Ohio, in 1855. Whatever success it met with was not noised abroad, for it soon fell from sight, and the literature of agriculture is singularly silent in regard to its history. Quite different from this has been the history of the Michigan college. which commenced its real work about 1857, and that of the institution in Pennsylvania, and also of another in Maryland. These latter two colleges opened their doors in 1859. As these schools have been greatly modified by the U. S. act of 1862, their history is best detailed in connection with the system of national colleges.

During the few years before 1857, several bills on the subject of practical and scientific education were brought before the national congress. And one, introduced into the house of representatives by Mr. Morrill, of Vermont, was nearly successful. From the first it met with the greatest opposition from the Southern members, who were too intent on introducing slave labor into the territories to think of tolerating industrial education in the states. As Mr. Morrill was chairman of the committee on education, and a Southern man was chairman of the committee on public lands, the bill was referred to the latter committee, where it was kept back as long as was possible, and then produced with an adverse report. Then came a discussion in the house, and another in the senate where it was strongly opposed by Jefferson Davis and others, and finally passed by a majority of two. More than two years had passed since the introduction of the bill, and it was immediately vetoed by President Buchanan. In June, 1862, while most of the opposition were employed south of the Potomac, the bill was again brought before congress. It passed both branches by a vote that was four to one in its favor, and was immediately approved by President Lincoln.

The provisions of the bill were simple in their nature, and easy to be enforced. First, it provided for at least one institution in each state, and gave, as an endowment, land to the amount of thirty thousand acres for each member of congress. Next, it provided for an annual report to be sent by each college to every other college in the system, and made each state forever responsible for the money received from the sale of its share of the land. This money was to be an instruction fund, and the state must guarantee at least five per cent. interest upon it. Finally, nothing could be much more liberal than the scope of these institutions. The bill says of these colleges, "Their leading object shall be—without excluding other scientific and classical studies, and including military tactics—to teach such branches of learning as are related to agriculture and the mechanic arts, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life."

It had taken hardly more than a decade to bring about the foundation of these colleges, and a friend of the movement might think that the hardest part of the work had been done: in reality it had been but begun. The succeeding twenty years were destined to be full of trials and misunderstandings and disappointments.

Any one carefully considering the law of 1862, and the history of the movement which produced it, must understand the broad basis on which the colleges were built. The law was part of a great movement for scientific and practical education—a movement that had begun before these colleges were organized, and has been materially helped by them. In 1860 there may have been twenty institutions that recognized other than classical methods of training; now there are nearly ten times that number, and they are yearly granting degrees to about twelve hundred students.

These national colleges, however, came to be known as agricultural colleges, and with that name came one of their great troubles. A considerable portion of the community fell into the opinion that these institutions had been established for only one purpose, and proceeded to judge them exclusively from the standard of their agricultural instruction. The excellence of work in other directions was entirely disregarded, and in some cases was made the ground for systematic depreciation and condemnation. However unjust any such opinion may be, it can not be questioned as a matter of history that it has existed to an extent sufficient to prevent some of the colleges from doing a very high grade of agricultural work. In some farming communities the distrust has proceeded so far, that those who would naturally be the patrons of agricultural instruction have stood aloof and awaited results. Worse than demanding bricks without straw, they have withheld the clay also, and have been waiting for institutions without agricultural students to produce farmer graduates.

Of course there are two views which may be presented. There may have been farmers who had extravagant expectations—who looked upon agricultural professors as magicians having the ability to transfer their power to their students, so that a graduate of an agricultural college, like the witch-hazel-using finder of hidden fountains, would go about turning worn-out acres into productive meadows, and thistle patches into waving fields of grain.

There were certainly others who believed neither in agricultural education, nor in very much education of any kind, for farmers, and so had the easy task of condemning everything connected with the subject because it was not something else.

On the other hand, there were few men fitted to give agricultural instruction. There were still fewer works suitable for text-books, and systems of agricultural lectures either have in them the work of years, or are worse than useless in a college. In some cases the national colleges fell into the hands of men who had little understanding of the ends to be aimed at and the classes to be benefited, and they constructed courses of study agricultural in nothing but the name. Instead of horticulture, they suggested Greek roots, and having put a little natural history in the place of some of the classics, depended upon agricultural chemistry to cover a multitude of deficiencies.

The difficulty in this part of the college work was further increased by the fact that there was no recognized standard of work before the public. Patrons knew not what they would demand, and friends, directors, and instructors were in doubt as to methods, and frequently were compelled to appear inconsistent.

Despite all these difficulties, nearly every college that has persistently attempted to do good work in agriculture has met with fair success, while some have met with the most marked success. Most of them are better fitted than ever before to do good work, and offer great possibilities for the future.

When the states came to make use of the proceeds of the national appropriation, several methods were followed. The easiest way for the state was to turn over the fund to some existing institution, which only in a few cases could be an agricultural college, and to require it to add an agricultural course if it gave scientific instruction, and several scientific courses if it gave only literary instruction. By this method the state incurred no expense, took little responsibility, and reserved all rights of grumbling.

The states that had no agricultural colleges and followed this method can be put into one class, and the other states can be put into four classes, although the misleading titles of colleges, the absence of full information, and the uncertainty of many of the statistics, make the limits of division somewhat uncertain, and take much from the accuracy of the conclusions.

In the first class are three New England states (Connecticut, Rhode Island, and Vermont), two Middle states (Delaware and New Jersey), six Southern states (Kentucky, Louisiana, Missouri, Mississippi, North Carolina, and Tennessee), and the Western states Minnesota and Oregon.

Of the colleges thus endowed in the New England states, two, at least, have done excellent work upon subjects within the scope of the national act, and one has been especially marked for its good work in agricultural chemistry ; but agricultural students have been curiosities in all three of the states, for the three colleges together have probably not graduated three such students during the last fifteen years.

In New Jersey it appears, from the occupations of ninety-nine of the scientific graduates from 1869 to 1881, that 6 per cent. are connected with agriculture, and 41 per cent. with engineering. If the per cent. of scientific students taking the agricultural course is twice as large as is indicated by this, there is one agricultural student for each 200,000 of the population of the state.

In Missouri the national appropriation turned the state university into an institution with twelve courses,—under-graduate and post-graduate. Between 1869 and 1881 five degrees in agriculture were granted. The arrangement of the courses is such that this gives no measure of the number of students who take an agricultural course or one or more studies of that class. Including all these, the result is one agricultural student to 27,000 inhabitants. This branch of the university work is being energetically pushed, with a decided tendency toward a short course, with only elementary requirements for admission.

In Tennessee, East Tennessee University was changed into Tennessee University, which offers eight courses of study. Between 1871 and 1880 it granted 91 degrees, and during the latter year had eight students in the agricultural course.

Kentucky and Mississippi each organized a new department in the state university, but each, in 1878, detached this department and organized a separate college. In Mississippi the new college opened its doors in the fall of 1880, and enrolled during the first year eighty-seven students in the regular course, and a much larger number in the preparatory course. It calls itself an agricultural and mechanical college, but at present has only a single course.

The officers of the college call attention to the fact, that during several years, while there was a connection with the state university, there was not a student taking the agricultural course, while a period of less than three years of separate existence has been sufficient to put one hundred and fifty students into the regular course, and a larger number into the preparatory department. It claims the third place among colleges in the number of agricultural students.

There is another college in the state doing work for colored students, but this institution alone, if it is doing real agricultural work, has at least one student for each seventy-five hundred of the population.

As a rule, all the old colleges that have received any part of the national appropriation have done better work in the old ruts, but they have not learned how to attract agricultural students. Having established the new courses, they have waited for men to study them, but the students that have come have generally been drawn into fields not agricultural. These colleges have been subjected to sharp criticisms, and every objection has made it more difficult for them to do the work demanded. Of several it may be said that no agricultural students have ever been graduated.

A second plan for establishing the new college was to place it beside an existing institution, but to keep funds and students distinct. The advantages urged are evident,—libraries, museums, instructors at nominal prices, and the reputation presumably gained. On the other hand, there has been an unfortunate current belief that agricultural students so situated are subjected to petty insults, that new institutions are overshadowed by the old, and unnoticed by those who bestow their money upon colleges, and that they are frowned upon if they show too much inclination to grow. It is quite certain that no college situated thus can teach agriculture successfully if destitute of two conditions. It may use instruction from the older college, but it must have an independent faculty, who are thoroughly in sympathy with the work, and it must give an education upon a basis sufficiently broad to give its students an assured position. Apparently New Hampshire is the only state that organized a college in this manner, and the fund upon which it was established was smaller than that of any other college established upon its own funds. This college has graduated, from 1871 to 1883, eighty-five students, one third of whom are connected with agriculture, and, leaving out those taking other courses, it has one agricultural student for 13,000 inhabitants, a ratio exceeded by only a few of the most successful of the national colleges. How much its successes and failures have been due to the peculiarity of its situation can not with propriety be discussed at this point.

A third plan adopted by some of the states was to establish a university something like that of Cornell in New York, which aims to teach everything, or like the University of California, which offers four courses to graduates and eight to undergraduates. Illinois established an institution which had ten courses, and was called an industrial university, a name which was also adopted by Arkansas, while the simple term " university " was adopted by Ohio, West Virginia, and Wisconsin. These institutions are not, as a rule, criticised as sharply as those of the first class, but like them they do not do their best work in agriculture, if we may judge from the courses selected by students.

Just now an item is floating through the papers to the effect that Ohio has not graduated as yet an agricultural student.

Cornell University, where nothing is spared to give the best instruction in agriculture, has fifteen agricultural students, or less than one for 300,000 inhabitants, and of the graduates for eleven years four per cent. are connected with agriculture, while eleven per cent. are connected with engineering.

Illinois has 21 agricultural students,—one for 143,000 inhabitants; and among the 303 university graduates of ten years, 13 per cent. are connected with agriculture.

In the great University of California there are 11 agricultural students,—one for 79,000 inhabitants. According to a newspaper statement, 19 students have been graduated from this course, and less than half of them are farmers.

The colleges of a fourth class were established independently, and were called, for the most part, colleges of agriculture and the mechanic arts. Some of these institutions are nearly as broad as the universities. Most of them give at least half of their strength to agriculture, and the rest to mechanical or civil engineering courses. Purdue University in Indiana seems to belong to this class, though not in name, while the college of Alabama does in name, although it has four courses, one of which is literary.

In Georgia there is a central college, and then there are four other institutions, one for each of the "four corners" of the state. They take the name of college, but apparently do the work of a New England grammar school. The newly organized college of Kentucky, that of Mississippi, and a second college in Mississippi for colored students, also belong to the class of colleges of agriculture and the mechanic arts.

South Carolina, like Mississippi, has two institutions, and Virginia, besides supporting a college of agriculture and the mechanic arts, gives part of the funds for supporting Hampton Institute, which is doing a most successful work for black students and red students, but upon a plane lower than that upon which colleges work.

With the mention of Texas and Maine the list is closed. The college of the latter state has graduated, from 1872 to 1882, 180 students, of whom 11 per cent. are connected with agriculture, and 20 per cent. are engineers. If we suppose one half of the students to be agricultural, we have one for 16,000 inhabitants. So in the representation of the inhabitants by agricultural students, as well as in the per cent. of the graduates who are connected with agriculture, Maine stands third among the New England states, coming after both Massachusetts and New Hampshire. In fact, in proportion to numbers, New Hampshire has furnished agriculture with nearly three times as many graduates as has Maine.

In a fifth class may be placed those few states which had agricultural colleges at the time of the passage of the national act, and so reinforced them with the new funds ; and also that larger number of states which formed what they called agricultural colleges. In some cases the fund was divided, as in Massachusetts, and part of it used for a school with one course, pretty technically agricultural. In other cases the title was agricultural college, but the field covered was almost as broad as that of a university. One such college,—that in Colorado,—has been organized so recently that not more than one class, if any, has been graduated.

Among the remaining states,—Michigan, Massachusetts, Kansas, Iowa, Pennsylvania, and Maryland,—we find the best and most successful institutions, viewed from the purely agricultural standpoint. Not that these colleges are made successful by a single idea pervading all their work, for they have not been thus limited. Priority of organization, large endowments, and material support, explain the success more fully.

One of the pioneer colleges existed in the state of Pennsylvania, and it was exclusively agricultural in its first years, though much changed at present. The trustees made labor their cornerstone, and required the students to do everything. Not only they performed the labor of the farm, they managed the kitchen as well. The Iowa college, in a later time, has utilized student labor within doors and without ; but Iowa recognized co-education, while the young men of the Pennsylvania school were left to their own resources.

At the very beginning the school was filled with students, and many were turned away. The college was fortunate in possessing a remarkable president; it was unfortunate in having no fund, and in being obliged to contract a debt for the building itself. After five years the president died, the students began to enlist in the war, and the debt had mounted up to $80,000. The institution had been called a farmers' high school in the beginning, but after the national endowment it broadened its scope and changed its name. Under the protest of the faculty, the labor system was abandoned after a few years. The institution can hardly be called narrow in its present condition; for it has six courses of study, has Greek in one of them, has a sixth of its students engaged in the study of music, and half of the whole number in the preparatory course, while fully a fourth are females.

In 1881 there were about 60 students in the college course, a number which cannot give more than one agricultural student to 200,000 of the population. During twenty years of its history it graduated 105 students, 18 of whom became farmers and 15 lawyers.

Another one of the first agricultural colleges was in Maryland, and was established in 1857. It has apparently been fairly successful. Between 1875 and 1878 it graduated 13 students. It had, in 1881, 55 students, but these, only in part, were agricultural, as the college has a classical course. Hence the number of agricultural students cannot be more than one for each 30,000 of the population.

One of the most criticised, but on the whole one of the most successful, of the purely agricultural colleges, is that of Massachusetts. Its number of students is about 120, or one for 16,000 inhabitants. Its classes from 1871 to 1880 gave it 164 graduates, while 35 per cent. of these graduates are connected with agriculture, and only 6 per cent. with engineering. Its course has been somewhat meteoric, but its position at present seems better assured than it has been for several years.

The Iowa Agricultural College opened its doors in 1868, and had about two hundred students in the beginning. It received a yearly income of $36,000, while the state constructed a building which cost $170,000. It makes no distinctions of sex, and though agricultural in name, is not entirely so in its instruction.

Before the first class graduated, instruction was furnished in civil engineering, mechanical engineering, mining engineering, and architecture. This college has only one course of study, but offers a number of electives, while each student is required to give one hour per day to some kind of industrial training. With male students this means agriculture, carpentry, iron work, printing, or telegraphy ; with female students, sewing, telegraphy, printing, music, or scroll sawing. It possesses a professor of military science, who gives twenty-six lectures upon the subject, but military drill itself is optional.

Somewhat the same may be said of the Kansas State Agricultural College. Besides the usual instructors, the faculty list shows a teacher of instrumental music, a superintendent of sewing, another of telegraphy, and a third of printing. From the latter department comes a small monthly sheet, which is edited by the faculty.

Of all the colleges, apparently the most successful is that in Michigan. It seems to have overcome all opposition. It early came into favor with the people, and it has done good work from the beginning. Although the per cent. of the state's population which is found in the college is not much greater than in other states, the size of Michigan is sufficient to give large classes. At entering they contain eighty or ninety students, but at graduation not more than a third of that number. The college has been particularly fortunate during all its history. It graduated its first class in 1861, and just at the period when a college keenly feels the demand for more money the large national grant came to its aid. The newly organized colleges in the other states turned to Michigan for professors and instruction in agriculture, and thus added to the home reputation of the college, and made agriculture especially attractive to its students. And what is still more important, the state has pursued a most generous policy, giving large appropriations whenever they have been needed. The appropriations in 1881 exceeded $50,000, and the amount received during the twenty-five years since the foundation of the college is over half a million of dollars. One peculiar thing in connection with the institution is the fact that its trustees and the State Board of Agriculture are identical, and consequently one report is all that is ever issued for both state board and college corporation.

The Michigan college has about 200 students, or one for 8,000 of the population of the state. From 1861 to 1882 the college graduated 244 students. Of these 51 per cent. are connected with agriculture, while only 3 per cent. are engineers.

In Florida no college has been organized. Leaving out that state, we find forty-six institutions having the benefit of the national grant, and giving some form of scientific instruction. There are nearly as many more schools which are scientific in form, or have scientific departments, two or three giving some form of agricultural instruction. And there are nearly as many other institutions as these combined, which grant some form of a scientific degree; so annually, of about twelve hundred degrees of a scientific nature, about a third come from the nationally endowed colleges, which, according to the *Educational Report* of 1880, have forty-five hundred students in scientific courses. As only one third of these students are pursuing studies connected with the industries, and there are only thirty of these colleges that have an agricultural course, there are probably about one thousand students, excluding those in preparatory courses, who are engaged in the study of agriculture.

The increase in the number of general scientific students in the country has been very remarkable,—ten hundred per cent. in ten years; but this increase has been kept down by agriculture, and crowded up by other subjects. The departments of the colleges that are developing most rapidly to-day are those for instruction in the mechanic arts. Even in the purely agricultural colleges, like that in Michigan, which give only one course, there is a strong movement in favor of work-shops and workshop instruction.

In regard to preparatory departments, they are found in more than half of these national colleges. Some of them are found in the West, and they are common in the South, where a poverty of good schools makes the preparatory department of an agricultural college much the larger part of the college. In the five colleges of Georgia, five sixths of the students are in the preparatory classes.

Many of the colleges attempt to secure popularity with the farmers by opening special courses in agriculture, by offering short courses in chemistry, and by giving special lectures during the winter months. Vermont has tried this latter plan with little success; Ohio more successfully, as the attendance has reached at one time one hundred and sixty. New Jersey offers a two years course in addition to the regular one, and Tennessee has a special course of the same length of time. Students in this course are divided into two sections, each section reciting during one half of the week, and working during the other half.

Most of the agricultural colleges make a special point of giving help to students in the form of pay for labor. Some make the labor compulsory,—a plan that is becoming unpopular, and will probably be abandoned. The prices paid are sometimes graded,—frequently not more than eight or nine cents per hour. The twelve and one half cents per hour paid in the New Hampshire college is probably as much as is paid in any college.

In all these colleges the expenses are less than in other scientific schools. In some the tuition is free to all; in most, scholarships make it practically so, and the strong tendency is to make tuition in all of these institutions entirely free.

Of all forms of instruction found in the colleges of the United States, those connected with the colleges of agriculture and the mechanic arts are the most expensive. At the point where the instruction in the classical college has been provided for, the expense in a technical institution has but begun. And in fact, the most expensive features in instruction connected with the old colleges of the country are those which are taken from these scientific institutions. There are courses, like those in civil engineering, in which instruction is comparatively inexpensive; but the scope of the national colleges requires model farms, expensive buildings, experiments always costly, and workshops with machinery and tools,—all of which are non-productive, and a constant source of expense. Hence these colleges appear as chronic beggars in the state legislatures; and the successful institutions are most of them successful beggars. The first demand upon the states was for buildings, but now, with buildings and endowments, most of these state colleges find that they must ask for annual appropriations, or fail to do the work demanded from them. Sooner or later nearly every state voted appropriations. In Alabama the buildings for the college were given by the Methodist church, and nothing was granted until a few months ago, when the trustees went to the legislature with the statement that thirty-three similar institutions had received on an average $130,000 in appropriations. The reply to this was a vote giving $150,000.

In income, Cornell heads the list with its $230,000. Next comes the University of California, with a yearly income of $100,000, while it has received more than any other college in appropriations. It has received from the state $35,000 for its library, nearly half a million of dollars for its buildings, and over a million for general expenses. The Iowa college, with an income of $44,000, has received nearly ten times that amount in buildings ; while the state of Minnesota, in addition to gifts amounting to a third of a million, has recently passed a bill making a yearly appropriation of $30,000 for the state university. The income of $4,800 received by the state college of New Hampshire is the smallest income received by any one of the colleges doing independent work.

Upon the income of $30,000, Pennsylvania has been trying to support its college and three experimental farms, but through a series of difficulties, misunderstandings, and financial troubles which culminated in a legislative investigation in 1883. Whatever conclusions may be reached from the three hundred pages of contradictory testimony, one fact is certain,—that college must reduce its scope, or increase its funds.

In these days of a large national income and internal improvements, it is quite possible that congress will make some further recognition of the national colleges. Help may be given them without increasing their funds or adding very much to the expense of the work now being done under the direction of congress. One of the most reasonable and simple plans proposed is to establish in connection with each college an experimental station, under a management recognizing the commissioner of agriculture, the local college, and the agricultural board of the state. These all may be arranged so as to make a division of experiment work, giving each college practical instruction, each state a series of valuable experiments adapted to its situation, and the government and the nation fuller and more valuable information than can now be gathered into an agricultural report.

Some of the colleges commenced operations on the broad basis, that being endowed by the nation they had no right to make any distinctions of sect, sex, or color. So coeducation soon became an established principle among the colleges of the West, and from the West has come to the national colleges of the East, until at the present time women are admitted to a majority of all these institutions. In many of the colleges they form a large fraction of the students. One of the catalogues of the Kansas college shows that a third of the two hundred and fifty students are women. This institution has added special instruction in telegraphy and printing, and in cooking and sewing. Nebraska and Pennsylvania furnish instruction in music; but in most colleges women taking the courses find few or no modifications for their benefit. One University, which gives a combination of all sorts of instruction, kindly explains that "bachelor is a degree word having no reference to sex, and may be given to girls," but sternly adds that "A. D. B. (bachelor of domestic arts) points to home life as the destined sphere of women," and can be granted to no males.

Although agriculture was only one of the subjects contemplated in the national scheme, it was intended to give it a prominent place in these colleges. It has been specially under consideration in state appropriations, and is the one thing in which there has been a general desire to do successful work. Each college has, in a great measure, worked independently of every other college, and yet the agricultural courses of nearly all the successful institutions are nearly the same. There have been attempts to provide short courses of not more than two years, and to make the education outside of technical agriculture consist of only the merest rudiments; but nothing of the kind has thus far met with success sufficient to recommend it to other colleges. It is successful at Hampton, Virginia, where the problem is to give negroes and Indians civilization, rudimentary education, and a knowledge of the first principles of agriculture. But any such system bids fair to be a failure among young men, who understand all of the ordinary details of farming before they enter any institution. Those who will leave a farm and go to any kind of a college are men of sufficient character to despise any course that does not put them on something near an equality with graduates of other scientific institutions.

While general culture has been given a prominent place in other technical schools, it has been especially needed in the agricultural colleges; for the latter, much more than the former, have been obliged to take students from the common schools, and to give them all the culture and general education ever obtained by them in the school-room.

Into the scheme of agricultural education at least four things must enter. First, those studies giving that knowledge which especially and alone distinguishes the educated man from the uneducated,—that is, a knowledge of the national language, literature, and history. These studies are prominent in all the national colleges, which in most cases have also the modern languages, and in a few cases the dead languages.

The second requisite for agricultural education is a thorough scientific training, with mathematics sufficient for surveying, and an understanding of mechanics.

In the third place, there must be a special prominence given to chemistry, and those branches of natural history which are connected with agriculture.

Last comes the study of technical agriculture. It is true that agriculture is one of the most complicated of subjects, and that all of the sciences enter into it. It is also true that as a science it has not developed as rapidly as other sciences, and that a great deal that has been written about it has been written by men ignorant of the subject, who have darkened "counsel by words without knowledge." Here is one of the difficulties in the way of the instructor in agriculture. While in engineering there have been many excellent class-books, in agriculture it has been necessary for the instructor to depend upon lectures and illustrations, and at the same time cover a field so broad that a high grade of work has been nearly impossible. That difficulty has been partially overcome, and in the future much more will be done than has been done in the past. On several agricultural subjects good text-books have already been written, and more are to follow.

Of these technical subjects there are many that deal with crops and fields, and are really to be reached through experiment work; but there are other subjects that may be studied through books, or through books and experiments together.

Dairying is one of these subjects. Upon it there is an excellent text-book, and the supplementary work is not difficult.

Farm drainage can be studied through at least three text-books. There are also recent works upon forestry and irrigation.

Stock-breeding can be studied through the work of a professor in one of the agricultural colleges.

Such subjects as animal nutrition, plant growth, and soil fertilization are more complicated, but are not beyond the reach of text-books, lectures, and practical illustration.

Veterinary science is another technical subject which is within the scope of the agricultural colleges, and owes to them part of its development. In the past the quadrupeds have been delivered over to the tender mercies of local horse doctors, who have considered that animals have no right to more than one or two diseases, and have consequently employed but one or two specifics. Animals inventing new diseases have been punished by being compelled to take the regulation dose, and have seldom transgressed more than once. Mr. Beecher tells a story of a doctor that once took charge of a sick horse for him. This man of science punched the animal in various parts of its body, and then, with a look of profound wisdom, pulled out a handful of hair, which he rolled into a ball, and forced down the throat of the patient. As the science stands to-day, it has, in a single city of the United States, two colleges for veterinary education, and two journals apparently of a high grade. In other parts of the country there are other colleges. There are many works being written upon the subject, and the agricultural colleges are making it a marked feature in their instruction, while Cornell gives to it a special course. It is not claimed that an agricultural college can make every graduate a veterinary surgeon: it can give the state one man competent to deal with the questions arising in connection with wide-spread animal diseases, and it will give every agricultural graduate sufficient knowledge to allow him to relegate the horse doctor to the locality of surgeon barbers.

The present tendency is to give experiments an important place in the work of agricultural colleges. When they are such simple experiments as can be performed by any intelligent farmer, the college merely prevents a duplication of work, and assumes the load of all the blunders and losses for a state. From this the experiment station rises in importance through a grade of work too expensive for private enterprise, until it reaches the heights attained by such experimenters as Laws and Gilbert. On this ground it has been claimed that an agricultural college, even without a student, may give back to agriculture more than it has cost.

The result of a single experiment may save a state thousands of dollars, and only a small fraction of the great number of experiments tried need be successful to pay back the cost of all the experiment stations in the country. Such work in connection with an agricultural college answers a double purpose. It is valuable in results for the farmer; it is valuable in instruction for the student. While mere compulsory manual labor for students is expensive, unpopular, and unsuccessful, work in connection with experiments is educating, and helps to build up a class of graduates who will do for agriculture what the great inventors have done for manufactures.

Experiment work begun by colleges has been recognized by legislatures, until experiment stations, by means of bulletins and annual reports, have become one of the great agricultural educating influences of the country. With the better facilities now being obtained the value of the work is likely to increase, while the number of aimless experiments will decrease. To reach the highest results, it is necessary to have some system by which the colleges shall work in connection with the department of agriculture.

When all the national colleges, and particularly those that make a specialty of agriculture, have passed through the period of unsparing criticism and extravagant expectations, we may expect the best work from them. They need not be expected to revolutionize agriculture: they cannot give a direct education to every man who tills the soil. If we take the most successful college in the country,—the one that is fitly considered as a model for the other colleges,—we find the students enjoying its benefits are only about one eight thousandth of the population of the state, or perhaps one student for every thousand men in the state who are engaged in agricultural pursuits.

The proportion is still further reduced when it is limited to those of the graduates who are connected with agriculture. Of the graduates of the model and exclusively agricultural college of Michigan, about fifty per cent. are connected with agriculture, although part of these are teachers of agriculture, presumably with good salaries. The Massachusetts college sends about thirty-five per cent. of its graduates into agriculture; that of New Hampshire, although not entirely agricultural, about thirty-three per cent.; the college of Maine hardly more than eleven per cent.,—while most of the colleges in other states fall still lower.

Such facts as these are often made the grounds of very sharp criticism, and sometimes the grounds for chronic grumbling.

There are just three potent facts that are forgotten in all these cases:

First. The history of the movement before the national law, and the law itself, show that these colleges were never intended to be exclusively in the interests of agriculture. They were intended for the practical education of the industrial classes, and that is the work they do, even if two thirds of the graduates do not become farmers.

Second. The reasons that keep young men from becoming farmers are so far back that no college can reach them. They act upon the young men who go to agricultural colleges and those who do not, and are evident to even the most careless observer in any farming community. Those students who enter college intending to remain farmers, graduate well equipped for the work; those who enter an agricultural college determined not to be farmers will graduate with the same mind. But one of the great things that keeps agricultural graduates from farming is a want of capital. A considerable part of these graduates are men who have intellect and energy, but no money. Like other men and most farmers, they turn where they can make the most money, and that is frequently not in agriculture. Many a graduate who prefers farming in the beginning never becomes a farmer.

Third. The number of students in the colleges and the per cent. of the graduates upon the farms of the country afford no adequate measure of the influence of the colleges upon agriculture. There must be an influence from the graduates actually in the work,—the sixty of Massachusetts, the thirty of New Hampshire, and the twenty of Maine. Three agricultural colleges in little New England have in a few years put over a hundred educated men into the work of agriculture, and the one college of Michigan has furnished more than the three together. But that the influence is unmeasured by numbers seems shown by the way in which every improvement originating from the college is shared by the public. If one of them were to discover some process revolutionizing the science, it would be in the hands of farmers almost as soon as in the hands of graduates. The very existence of such colleges has added to the dignity of agriculture and the social position of the farmer. For him the sciences are being ransacked, labor and learning are laying their stores at his feet. For his benefit, about the colleges are collected groups of specialists, and for his benefit are going from their doors young men with a training that will fit them to become the specialists of the future.

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